

1. Thesis statement

Space exploration should be pursued as the economic, scientific, political benefit outweigh the risk and cost of it.

2. Brief explanation as to why the question is a controversial issue.

Space exploration has always been the one of the humanity's greatest goals and curiosities. However, this highly intellectual activity also happens to be very expensive and risky. Consequently, people question whether space exploration should be pursued despite its opportunity cost.

3. Brief outline of at least two sides on the issue, their rationale, and the value that they necessarily are demonstrating.

Space exploration is worth the cost

Those who advocate space exploration mostly believe that space exploration is necessary for it represents the creativity and urge for exploration of people. Moreover, some state that the astronomical expenditure can stimulate the economy and create jobs. Also, there is an argument that space exploration is environmentally sound for eventually, resources and real estate can be allocated throughout the space. In addition, the ongoing space exploration can encourage the students to study physics and mathematics, which are areas that are critical in our society. Finally, space exploration gives the citizens pride, and opportunity for many nations to cooperate under the branch of astronomy.

Space exploration is not worth the cost

The money that is spent on space exploration mainly comes from the tax that the citizens pay. Just in 2006 House appropriators have marked up NASA's budget at \$16.5. However, many taxpayers are unwilling to pay for space exploration, especially when NASA was unable to complete an audit of the agency's budget for five years. Furthermore, those who believe that space exploration is not worth its money are concerned about the risks and limitations in technology of space exploration, which can be evidently demonstrated by the Challenger and Columbia disasters. Also, the fact that there are many more urgent issues that demand dire attention and financial support such as, poverty and sustainable development is emphasized.

4. An outline of each paragraph in your body demonstrating an argument and evidence used to support it.

Introduction

Space exploration is worth its expense and should be pursued for its benefits in the economy, scientific field, and politics outweigh its opportunity cost.

Body 1: economic benefit

- stimulates the economy:

- on average, each dollar spent on U.S. research and development returns about \$9 in technology-induced economic gain. ¹
- the U.S. commercial space transportation business alone, from which NASA procures services, generated \$98 billion annually in direct and indirect revenues in 2004. ¹
- stimulate students to have interest in science and math:
 - 5 percent of Americans engaged in science and engineering generate as much as 35 percent of U.S. exports -> more students in the scientific field means greater economic potential ^{1,2}
- Response to the argument that space exploration is overfunded and too costly
 - in 2007 the US federal government spent 3% of its total budget on scientific and medical research in general ³
 - The Fiscal Year 2006 Federal budget was \$2.568 trillion, of which NASA's share was \$16.2 billion, or less than 0.6 percent. ¹
 - People overestimate the money spent on NASA: NASA's allocation, on average, was estimated to be approximately 24% of the national budget when NASA's allocation in 2007 was approximately 0.58% of the budget ⁴
 - the private sector's participation is increasing ⁵

Body 2: scientific benefit

- Learned about the universe
 - Through Hubble, we have observed directly the planetary cometary impacts that drive the evolution of life, witnessed the birth of stars that make all life possible and measured the size and age of the universe itself. ⁶
- Space exploration requires increased sophistication in, areas such as, rockets, communications equipment, computers, solar-power generation, cryogenic technologies (cooling and storing liquefied gas), and human-robot interaction ^{7 8}
 - for example, satellite-enabled global positioning data are employed by a host of hand-held and portable devices used by boaters, hikers, general aviators, and others. ¹
 - Satellite Industry Association reported over \$86 billion in satellite industry revenues for 2002 alone ²

¹ Why We Explore: The Value of Space Exploration for Future Generations

² More Than the Moon; the Space Program's Future.

³ WHERE DO OUR FEDERAL TAX DOLLARS GO?

⁴ Sustaining exploration: communications, relevance, and value

⁵ NASA Makes Space U-Turn, Opening Arms to Private Industry

⁶ Don't Desert Hubble; the Benefits of Space Exploration

⁷ In Defense of Space Exploration

⁸ Space Exploration

Body 3: political benefit

- Signifies technological advancement: space race during the cold war ⁸
- The case of China ⁹
- Post Cold War: opportunity for countries to cooperate and build alliances
 - examples: U.S. and Russia, European Space Agency (ESA), formed in 1975, whose 13 member nations include France, Italy, Germany, and the United Kingdom ⁸
- Success gives pride to the citizens

Conclusion

- The same controversy and uncertainties must have prevailed back when Zheng He and Columbus embarked on their plans to explore the world. However, world exploration unexpectedly turned out to be lucrative and changed the society tremendously. Similarly, the full breadth of the impact and benefit of space exploration cannot be predicted at this moment.
- Still, the economic, scientific, and political benefits give the justification to why people should continue with space exploration.

⁹ "China's rulers look to space to maintain Olympic pride."